

REMARKS

Entry of the foregoing and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

As correctly noted in the Office Action Summary, claims 1-62 were pending. Claims 1-18 and 28-35 have been allowed. By the present response, claims 19, 23, 26, 39, 48 and 57 have been amended and claims 38, 47, and 56 have been canceled. Thus, upon entry of the present response, claims 1-37, 39-46, 48-55 and 57-62 remain pending and await further consideration on the merits.

Support for the foregoing amendments can be found, for example, in at least the following locations in the original disclosure: the original claims.

Entry of the foregoing is appropriate pursuant to 37 C.F.R. §1.116 for at least the following reasons. First, the amendments raise no new issues that would necessitate further search and/or substantive reexamination. Second, the amendments clarify claimed features in a manner which more clearly advances the application to allowance.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 19-27 and 36-62 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. to 6,359,681 to Housand et al. (hereafter "*Housand et al.*") in view of U.S. Patent No. 5,729,376 to Hall et al. (hereafter "*Hall et al.*") on the grounds set forth in paragraph 4 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

The present claims of the application are directed to an imaging optical apparatus, a method of gathering imagery from a target and a method of constructing an imaging optical apparatus. In exemplary embodiments, multiple wavelengths, e.g., a FLIR wavelength, a laser designated wavelength, and a laser ranger wavelength, are optically viewed and manipulated by common optically significant elements of the apparatus, e.g., primary and secondary optical elements. The material, prescription, and coatings of the optically significant elements are selected to allow manipulation of the different wavelengths of energy and projection of at least two of the wavelengths at a common focal plane on a single detector. In one aspect of some embodiments of the imaging optical apparatus, a split Mangin mirror is formed with a first portion and a second portion and the narrowband coating is at an interface of the first portion and the second portion.

Applicants' independent claims broadly encompass the above apparatus and methods.

For example, independent claim 19 recites that an imaging optical apparatus comprises, *inter alia*, a first optical system having a first field of view for projecting at least a first portion of incident radiation emitted from a target to a first focal plane, a second optical system having a second field of view narrower than the first field of view for projecting at least a second portion of the incident radiation to a second focal plane, and a third optical system configured to receive radiation reflected from the target, the third optical system being selectable to project the reflected radiation to the second focal plane. The second and third optical system share an entrance aperture and the first focal plane and the second focal plane are incident. The second and third optical systems also include a common primary mirror wherein the

common primary mirror is a Mangin mirror with a narrow band coating. The primary mirror is a split mirror with a first portion and a second portion and the narrowband coating is at an interface of the first portion and the second portion.

Independent claim 23 is directed to a method of gathering imagery from a target. The method comprises the steps of, *inter alia*, receiving radiation emitted from a target in a first wavelength range using a first optical system having a wide field of view (WFOV), the first optical system projecting a WFOV image onto a first detector, receiving radiation emitted from the target in the first wavelength range using a second optical system having a narrow field of view (NFOV), the second optical system projecting a NFOV image onto the first detector, and receiving radiation in a second wavelength range using a third optical system, said radiation in the second wavelength range being emitted from a first designator laser toward the target and being reflected by the target, the third optical system projecting a designator image onto the first detector. The second and third optical systems share an entrance aperture and the NFOV image and the designator image can be simultaneously projected under the first detector. The second and third optical systems also include a common primary mirror wherein the common primary mirror is a Mangin mirror with a narrow band coating. The primary mirror is a split mirror with a first portion and a second portion and the narrowband coating is at an interface of the first portion and the second portion.

Independent claim 26 recites that a method of constructing an imaging optical apparatus comprises the steps of, *inter alia*, providing a first detector, providing a first optical system having a wide field of view and being configured to receive radiation emitted from a target in a first wavelength range. The first optical system

being selectable to project a wide field of view image onto the first detector, providing a second optical system having a narrow field of view and being configured to receive radiation emitted from the target in the first wavelength range. The second optical system being selectable to project a narrow field of view image onto the first detector, and providing a third optical system configured to receive radiation in a second wavelength range emitted by a first designator laser toward the target and reflected from the target, the third optical system being selectable to project a designator image onto the first detector. The second and third optical systems share an entrance aperture and the narrow field of view image and the designator image can be simultaneously projected onto the first detector. The second and third optical systems include a common primary mirror wherein the common primary mirror is a Mangin mirror with a narrow band coating. The primary mirror is a split mirror with a first portion and a second portion and the narrowband coating is at an interface of the first portion and the second portion.

Housand et al. discloses a combined laser/FLIR optic system. As described at column 6 and in reference to Figure 4, IR energy enters a segmented target acquisition window and is collected by a common pitch/yaw gimbal afocal 401. *Housand et al.* explains that "common" refers to the use of the same aperture to transmit and/or receive IR energy as well as laser energy and is actually a set of lenses comprising one positive lens 401a and two negative lenses 401b and 401c. IR energy is then directed to a turning mirror 403 which directs the IR energy down to pitch-axis center line 405. Turning mirror 406 then redirects the laser energy and the IR energy parallel to the system longitudinal axis where it encounters Dichroic D1 located within the FLIR relay/FOV assembly 407. Dichroic D1 separates the

incoming energy based on spectral content by transmitting energy having wavelengths greater than 2.7 microns and reflecting energy having wavelengths shorter than 2.0 microns. Additional fixed lenses and movable lenses (411 and 412) are also included in the apparatus of *Housand et al.*

The Official Action recognizes that *Housand et al.* "fails to disclose that the second and third optical systems include a common primary mirror, which is a Mangin mirror with a narrowband coating." See, page 4 of the Official Action. In combination with the disclosure in *Housand et al.*, the Official Action then asserts that "Mangin mirrors in general and as disclosed in *Hall et al.* include a first portion and a second portion whereby the reflecting coating is at an interface between the two portions or alternately at a backside surface of the mirror, or could be a combination between a lens and a mirror or two mirrors separated by air space." See, page 4 of the Official Action. Applicants respectfully traverse this rejection.

A Mangin mirror does not generally include a first portion and a second portion with a coating at the interface of the portions as claimed in independent claims 19, 23, and 26 at issue here. Rather, the photonics dictionary, Laurin Publishing (2004) describes a Mangin mirror as a "second surface spherical mirror whose spherical first surface acts to correct the spherical aberration of the reflecting surface." Thus, the Examiner's offered description of what is known of Mangin mirrors does not seem to be supported in the lexicography of the art of optics.

Further, *Hall et al.* does not disclose the features relied upon by the Examiner. *Hall et al.* discloses an optical element that functions as a Mangin mirror formed by the lens element 11 and a reflectance coating on surface 13 of the lens element. As shown in Figure 1, lens element 11 is a unitary body and the reflectance coating is

on an outer surface 13 of the lens element. Thus, in contrast to the description in the Official Action, what *Hall et al.* actually discloses is a conventional lens 11 with a coating on an outer surface 13.

. Based on the differences between the cited references and the claims at issue here, Applicants respectfully assert that an obviousness based rejection is improper. The Examiner has not established a *prima facie* case of obviousness based on the disclosure in *Housand et al.* in view of *Hall et al.* These references do not teach or suggest all of the claimed limitations and there has been no showing of a suggestion or motivation to modify the references or combine the teachings in a manner that would have resulted in Applicants' claims. See, MPEP §2143-2143.03. Accordingly, withdrawal of the rejections is respectfully requested.

The remaining claims at issue in this rejection each depend directly or indirectly from one of independent claims 19, 23 and 26 and are therefore allowable over the cited references for at least the reasons already discussed. Accordingly, withdrawal of these rejections is also respectfully requested.

ALLOWABLE SUBJECT MATTER

Applicants note with appreciation the indication that claims 1-18 and 28-35 are allowed as noted in paragraphs 5-6 of the Official Action. An indication of the allowability of all pending claims is respectfully requested.

CONCLUSION

Favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

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